ZW
AF

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Sinnott Jr.	Examiner:	Le, Debbie M
Serial No.	10/090,275	Group Art Unit:	2167
Filed:	March 4, 2002	Docket No.	SVL920010088U S1

Title: **SYSTEM AND A TWO-PASS ALGORITHM FOR DETERMINING THE OPTIMUM ACCESS PATH FOR MULTI-TABLE SQL QUERIES**

CERTIFICATE UNDER 37 CFR 1.8

I hereby certify that this correspondence and identified enclosures are being deposited with the United States Postal Service, first class mail, postage prepaid, under 37 C.F.R. § 1.8 on the date indicated below and is addressed to the Mail Stop: Appeal Brief-Patents, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450, on December 22, 2005.

Sandra Parker

AMENDED APPEAL BRIEF

Mail Stop: Appeal Brief-Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Brief is submitted pursuant to the Notification of Non-Compliance With 37 CFR 41.37 dated November 25, 2005 and is filed in triplicate within one month period.

The $500 Appeal Brief Fee, due under 37 CFR Sec. 1.17(c), was paid on September 2, 2005. If necessary, the Commissioner is hereby authorized to charge payment of any additional fees required for the above-identified application or credit any overpayment to Deposit Account No. 09-0460

Adjustment date: 01/03/2006 SLUANG1
12/30/2005 SSESHE1 00000042 090460 10090275
01 FC:1402 500.00 CR

1. Real Party in Interest

12/30/2005 SSESHE1 00000042 090460 10090275
01 FC:1402 500.00 DA

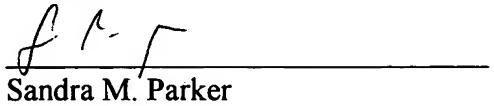
Moreover, the Examiner misinterpreted prior art and claimed present invention and combined references from different arts in order to reject claims 1-2, 5-8, 11-14 and 17-18, by quoting parts of sentences nonexistent in those references. However, even if these quotes are correct, the combination must be pointed to in the prior art itself and no such combination is pointed to in the cited references nor it could be since they are from different fields. Therefore, these references cannot be used to invalidate independent claims 1, 7 and 13 and their dependent claims because they fail to teach any and all the steps of these claims.

Improper combination of cited references is used in each claim rejection in the Office Action. None of the cited references suggests combination under In re Sernaker, 217 U.S.P.Q. 1, 6 (CAFC 1983), and one skilled in the art would have no reason to make a combination since they are from different fields, impossible to combine and individually complete. Moreover, none of the cited references discloses the subject matter and features of claims 1-2, 5-8, 11-14 and 17-18 of the present invention and even if they did show some individual features, they would not be able to meet the claims of the present invention which provide new and unexpected results over these references and are thus unobvious and patentable under Sec. 103(a).

In view of the foregoing, it is submitted that the final rejections of claims 1-2, 5-8, 11-14 and 17-18 are improper and, accordingly, the Board is respectfully requested to reverse the final rejections and order that this application proceed immediately to issue.

Respectfully submitted,

Date: December 22, 2005



Sandra M. Parker
Reg. No. 36,233

LAW OFFICE OF SANDRA M. PARKER
329 La Jolla Avenue
Long Beach, CA 90803
Phone/fax: (562) 597-7504

The real party in interest in this appeal is International Business Machines Corporation of Armonk, New York, the assignee.

2. Related Appeals and Interferences

There are no other appeals or interferences known to the appellant, the appellant's legal representative or the assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

3. Status of Claims

Claims 1-18 remain pending in the application and stand rejected and are the subject of this appeal. Claims 2-6, 8-12 and 14-18 are original claims. Claims 1, 7 and 13 were previously amended on November 24, 2004. A copy of all pending claims is set forth in an attached Appendix. Claims 1-2, 5-8, 11-14 and 17-18 stand rejected under 35 U.S.C. Sec. 103(a) and are under appeal. Claims 3-4, 9-10 and 15-16 would be allowable if rewritten in independent form. Advisory Action incorrectly names claims 4, 10 and 16 as rejected because they were held allowable in both Office Actions.

4. Status of Amendments

Amendment of November 24, 2004 was entered. Amendment and Response to Final Office Action containing a request for reconsideration submitted on June 7, 2005 has not been entered, as indicated in the Advisory Action of June 21, 2005.

5. Summary of the Claimed Subject Matter

Independent claims 1, 7 and 13 were amended on November 24, 2004 for clarification. All independent claims 1, 7 and 13 of the present invention are specifically directed to show that the present invention uses simulation in determination of the optimum join sequence, used for the access path plan for processing the query. Thus, the present invention uses a two pass process for creating a lowest cost access path plan for processing the query. As can be seen throughout the Specification (pp 6-12) and FIGs. 1-3, referenced by Specification page and line numbers and drawings referenced characters in following paragraphs, the present invention uses simulation and creates a set of miniplans for simulating all possible joins and simulated composite tables.

As shown in claims 1, 7 and 13, the present invention is directed to a system and a computer-based method for determining the optimum join sequence for processing a query having a plurality of tables from a relational database stored in an electronic storage device having a database management system, the method comprising the steps of:

(a) a first pass using simulation for determining an optimum join sequence for joining the plurality of tables from the query; and

(b) a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query.

Claim 2 is directed to the method according to claim 1, wherein the first pass performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step:

creating a set of miniplans for simulating all possible joins of a predetermined subset of the query tables; and

using a cost model calculations for estimating and saving the least expensive join from said set of joins, thereby determining the optimum join sequence.

As defined in Specification, on p.4, li. 15-19, the two-pass Dynamic Programming Algorithm 110 software of the present invention, illustrated in FIG. 1, is the computer-based method used for determining the optimum join sequence and the least cost access path for a relational database multi-tables query, as illustrated in FIGs. 2-3. As defined in Specification, on p.4, li. 21-24, the goal of the first pass 202 is only to estimate the optimum join sequence for joining the tables in the query. It is the goal of the second pass 204 to use this optimum join sequence to determine the detailed access path plan and the supporting data for the multi-table query execution.

As shown in Specification, on p. 6, li. 21 to p.7, li. 15, the two-pass Dynamic Programming Algorithm 110 simulates the construction of composite tables at each step. The strategy used to add a table to a composite table to create a second composite table which has one more table in it is represented internally by a control structure called a miniplan. Therefore, a miniplan represents each step of a generated access path plan. The miniplan contains information such as: which index to use, which join method to use, and whether or not any sorting of the one of composite tables or the new table is required as a part of the process. A cost model is used to

estimate the cost of each step of the algorithm so that alternatives can be compared. The cost is calculated in terms of CPU instructions time and I/O counts required to add a new table to a given composite table. The two-pass algorithm allows partial results of the cost model calculations to be saved for a given table and index, during the first pass, and used in subsequent calculations. This results in significant savings in CPU time.

As shown in Specification, on p. 8, li. 1 to p.8, li. 13 and FIG. 3, the first pass 202 of the two-pass Dynamic Programming Algorithm 110 of the present invention proceeds as shown in FIG. 3. The first pass performs following successive steps until a creation of a final simulated composite table having all tables from the query is detected in step 302, when the routine returns in step 304. Otherwise, each step 306 creates a set of miniplans for simulating all possible joins of a predetermined subset of the query tables, and each step 308 uses cost model calculations for estimating and saving the least expensive join from the set of joins, thereby determining the optimum join sequence. In more detail, step one of step 306, for each of the N tables from the query, simulates the construction of a one-table composite table. The access path plan chosen to do this makes use of local predicates and any indexes that are available and can be used. For each created composite table Cost and needed miniplan structures are built and filled in.

As shown in Specification, on p. 9, li. 17 to p.10, li. 6, in the second pass the only output from the first pass, namely the optimum sequence in which the tables are joined in the N-composite table, is input in the algorithm. The second pass makes use of this optimum join sequence of the simulated N-composite table to determine the detailed access path plan and the supporting data of the query plan. Therefore, the construction of the composite tables is simulated in the optimum join sequence. Steps one to three of the second pass are identical to these steps in the first pass. Namely, step one of the second pass, for each of the N tables from the query, simulates the construction of a one-table composite table. The access path plan chosen to do this makes use of local predicates, and any indexes that are available and can be used. For each created composite table Cost and needed miniplan structures are built and filled in. In the second pass, the number of Cost structures and miniplans is small (p. 11, li. 1-2).

As shown in Specification, on p. 11, li. 9 to p.11, li. 23, in the two-pass Dynamic Programming Algorithm 110 of the present invention the only information needed to be saved during the first pass is information which supports the determination of the optimum join sequence and thus significant reductions in CPU time and storage use have been achieved. For example, the storage

space used for one 15-table query dropped from approximately 94 MB to approximately 3 MB by implementing this approach. In the prior art every candidate miniplan was saved as a possible final solution. Each saved miniplan requires in excess of 1000 bytes and in complex queries there can be tens of thousands of these miniplans. In some preferred embodiments of the two-pass algorithm of the present invention, however, only some miniplan prototypes needed to support the first pass algorithm are saved. The storage required for each of these saved miniplan prototypes is only 22 bytes, because each miniplan in the present invention does not have to hold the whole miniplan.

Moreover, as shown in Specification on p. 12, li. 10 to p.12, li. 15, at each step of the algorithm a cost model is invoked to estimate the cost in CPU and I/O resources required to add a new table to a given composite table. The two-pass algorithm of the present invention allows only partial results of these calculations to be saved for a given table and index during the first pass, and they are used in subsequent calculations. This results in significant savings in CPU time and I/O resources.

6. Grounds of Rejection

The claims are on Appeal for the following grounds of rejection:

(A) Claims 1-2, 5-8, 11-14, 17-18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Krishna (U.S Patent 6,138,111) in view of Iyer et al (US patent 5,345,585).

7. Arguments

This Appeal Brief is exclusively directed to the Final Office Action because the Advisory Action only comments on an unentered Amendment and is, thus, irrelevant and so is the First Office Action which is moot because it only had 35 U.S.C. Sec. 102 rejection.

(A) Sec. 103(a) Rejection of Claims 1-2, 5-8, 11-14, 17-18

Sec. 103(a) Rejection of Independent Claims 1, 7 and 13

i) Examiner has Misinterpreted the Limitations of the Claims and Prior Art

To establish prima facie obviousness of a claimed invention, all the claims limitations must be taught or suggested by the prior art, MPEP Sec. 2143.03, citing *In re Royka*, 180 USPQ 580 (CCPA 1974).

The present invention, as shown in Specification on pp.6-12 and in the Summary of the Claimed Subject Matter section above, is directed to a system and a computer-based two-pass method using simulation for determining an optimum join sequence for joining the plurality of tables from the query and using the optimum join sequence for creating a lowest cost access path plan for processing the query.

All independent claims 1, 7 and 13 of the present invention are specifically directed to show this and they recite novel structure and thus distinguish over the cited prior art, under 35 U.S.C. 103(a). As shown in claims 1, 7 and 13, the present invention is directed to a system and a computer-based method for determining the optimum join sequence for processing a query having a plurality of tables from a relational database stored in an electronic storage device having a database management system, the method comprising the steps of:

(a) a first pass using simulation for determining an optimum join sequence for joining the plurality of tables from the query; and

(b) a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query.

Independent claims 1, 7 and 13 thus clearly state that the present invention uses simulation in determination of the optimum join sequence, used for the access path plan for processing the query. Moreover, the present invention clearly uses a two pass process, as shown in the title and independent claims, for creating a lowest cost access path plan for processing the query. As can be seen throughout the Specification (starting on page 6) the present invention uses simulation and creates a set of miniplans for simulating all possible joins and simulated composite tables. These claimed novel features distinguish over the cited prior art, under 35 U.S.C. 103(a), and are described in Figures and Specification on pp. 6-12.

Applicant regrets that all his attorney's attempts to obtain an examiner's interview and explain misinterpretation of certain computer science terms in office actions were unnecessarily turned

down, despite her numerous attempts to talk to the Examiner and his supervisors, thus prolonging prosecution and causing unnecessary costs. Each Response to Office Action clearly explained each misinterpretation, but to no avail, because they were again repeated verbatim, with all grammatical errors. Further, the prosecution was prematurely cut off. Applicant is justly entitled and should had received cooperation and a full and fair hearing (MPEP 706.07) because rejection reasoning was not clearly developed and did not include rebuttal of all arguments raised in the Applicant's reply nor produced required documentary evidence. Moreover, Final Office Action introduced new grounds of rejection and several alleged motivation grounds, that were neither necessitated by Applicant's Amendment nor based on IDS, and Applicant has the right of rebuttal, which was not allowed.

As per claims 1, 7, 13, Office Action stated that Krishna discloses the recited limitations as follows:

'a computer-based method for determining the optimum join sequence for processing a query having a plurality of tables from a relational database stored in an electronic storage device having a database management system' *as the process of a join order optimization for a multiple join queries in a relational database management system* [See col. 1, lines 5-6], the method comprising the steps of:

'a first pass for determining an optimum join sequence for joining the plurality of tables from the query' *as the calculating an optimal order for join of tables in a multiple join query* [See Fig. 1, col. 3, lines 24-26, 31-32];

'a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query' *as a join order selected among other possible join orders, wherein the selected join order has the smallest sigma (i.e., lowest cost) and the optimal access path to perform the join query* [See Fig. 2, col. 3, lines 44-50].

The Applicant respectfully objected to numerous misinterpretations found in this rejection. Krishna reference does not have the quoted language and cannot perform the claimed steps. The quotations are taken verbatim from the claim 1 of the present invention, with some italicized words unfound in Krishna reference and Krishna reference page numbers added in brackets. This way of writing is impermissible. PTO rules require use of English language and, thus, the proper English grammar, which was not followed in the Office Actions. Such use of quotations is a

material misinterpretation of the reference's teachings. Moreover, the Krishna reference does not contain teaching of the italicized language. Therefore, Krishna references was misinterpreted and deemed to teach what was not shown in the reference. Thus, that Office Action statement and rejection is incorrect.

To establish prima facie case of obviousness under 35 U.S.C. 103 (a):

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Office Action must find all claim limitations in the references. In this case, however, both Office Actions rely on references which do not show all limitations of the claims of the present invention, do not have similar utility, function, properties and are from a different field, and none shows any motivation to combine references. Scope should be in the field of applicant's endeavor or reasonably pertinent to the particulate problem with which the inventor was concerned, but that was not shown in the Office Actions. Examiner selects elements to replace or add to the primary reference, although there is nothing to suggest that that should or could be done, that they could be used or operate in the manner recited in claimed invention and for the same purpose.

Namely, both Office Actions use the practice, subject to abuse, which disregards the law because in them some parts of claim 1 and even parts of claimed steps (a) and (b) were considered in isolation. For example, some language from claim 1, such as the word "simulation" is missing between the quotes without proper marking. Examiner should not disregard express limitations, literally recited in the claim and disclosed in specification. In re Gulack, 703 F.2d 1381, 1384 (Fed. Cir. 1983) the court stated that the claim must be read as a whole and software limitations cannot be dissected from the prior art to support a rejection under 35 USC 103. The claim may not be dissected into arbitrarily selected discrete elements to be analyzed in isolation but must be considered as a whole. This law was not followed in Office Actions. Claim 1 was dissected in arbitrary pieces, often placed between quotation marks, alleging that the language was found in

the prior art, although it was not. Neither preamble nor steps (a) and (b) limitations of claim 1 were reviewed in entirety. They were dissected, some parts were removed, and then each remaining part was reviewed in isolation. Thus, claim 1 was not reviewed properly as a whole and words were taken selectively, picked and deleted without clear showing of such actions and then put under quotes, which is an intentional misinterpretation of the claims. Furthermore, some words were italicized and placed next to Krishna reference columns although they do not exist in the reference. Therefore, the Office Action statement and rejection of claims 1, 7 and 13 is incorrect.

Final Office Action stated that col. 1, li. 5-6 of Krishna reference state that this invention relates to join order optimization. However, the cited Krishna reference is directed to Cardinality-Based Join Ordering, as shown in the title, which is in a different field from the present invention. Because Krishna reference uses cardinality-based join ordering, it calculates a lowest cost using a sigma metric as a cardinality of each join by summing table cardinality estimates, preferably determined by a graph or retrieving a pre-computed value, as can be seen in col. 3, li. 46, li. 59-67.

Thus, Krishna reference teaches use of a method of calculation and does not teach use of a method of simulation. Further, Krishna reference does not teach use of a two pass process for creating a lowest cost access path plan, as shown in steps (a) and (b) of the present invention. Krishna reference does not even mention access path plan. Moreover, Krishna reference merits the candidate join orders as a whole (Abstract) and not for partial miniplans, as does the present invention.

Cited Fig. 1 of Krishna only shows a hardware and software configuration which is unrelated to the present invention. Cited col. 3-4 sections and Fig. 2 explicitly show an obtainment of cardinality and calculation of sigma, none of which is claimed in the present invention. Fig. 3-5 show graph formation and join cardinality estimation, none of which is related to the present invention. Cited col. 3, lines 44-50 describe what is a new metric sigma of Krishna reference, define it and declare that the smallest sigma is deemed optimal and used to perform the join. None of this is related to the present invention.

Further, contrary to the Office Action assertion that Krishna discloses 'a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query' *as a join order selected among other possible join orders, wherein the selected join order has the smallest sigma (i.e., lowest cost) and the optimal access path to perform the join query* [See Fig. 2, col. 3, lines 44-50]', Krishna reference does not even mention the creation of a lowest cost access path plan, as claimed in the present invention.

Moreover, Krishna reference teaches away from the present invention because it is directed to a one-pass calculations of table cardinality whereas the present invention creates a set of miniplans for simulating all possible joins and composite tables.

Therefore, both the claimed present invention and the Krishna reference were misinterpreted in the Office Action and thus cannot invalidate the claims of the present invention. Krishna reference clearly does not teach the features of the present invention, recited in the claims and throughout the Specification, namely, a two pass method, simulation and access path plan, which are not even shown in the Krishna reference. Cited reference does not show any feature of the present invention, operating in the same way and for the same purpose. Thus, the reference is from a different art field and cannot be used to establish prima facie case of obviousness under 35 U.S.C. 103 (a) because the subject matter as a whole could not have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Therefore, it is clear that the standard under 35 USC 103 has not been met for the claimed invention, because the cited reference Krishna does not have any and all elements of independent claims, is from a different field, has different components, works in a different mode of use and produces different results. Thus, independent claims 1, 7, and 13 and all claims dependent upon them in the present invention recite novel structure and therefore distinguish over the cited prior art, Krishna, and are not made obvious by it under 35 U.S.C. 103(a).

Next, Final Office Action held that Krishna does not explicitly teach using simulation. However, Final Office Action further stated that Iyer teaches using simulation for determining an optimum join sequence *(co/. 5, lines 12-27)* and that, thus, it would have been obvious to one of ordinary

skill in the art at the time the invention was made to combine the teachings of the cited references to use a simulation for determining an optimum join sequence as disclosed by Iyer, because this would allow users of Krishna's system to perform all possible join plan (join order) having the minimal cost is the optimal solution plan, so that the optimal solution plan (i.e., a low cost join plan) can be performed in a relatively short period of time, because a good join plan enables a query to be processed and data retrieved in an effective manner so as not require excessive processing time, as suggested by Iyer (col. 7, lines 52-58, col. 6, lines 60-67).

This is also a misinterpretation because Iyer does not teach use of simulation either. As is shown in Abstract and throughout the Specification, Iyer reference is directed to use of a KBZ algorithm to determine a join optimization sequence. It does not use simulation and nowhere does it teach or suggests so. In the cited col. 5 section Iyer reference only mentions a prior art named Simulated Annealing which has nothing to do with simulation of the present invention but with numerous join order transformations with a probability threshold which is decreased during the optimization process. Moreover, this Simulated Annealing is described as performed in a single run process which is only a one pass process. Further, the reference does not teach details of this prior art. Cited Microsoft dictionary does not define this term 'Simulated Annealing' at all. However, the web site Dictionary.com gives in its 'The Free On-line Dictionary of Computing' definition for Simulated Annealing as: "A technique which can be applied to any minimisation or learning process based on successive update steps (either random or deterministic) where the update step length is proportional to an arbitrary set parameter which can play the role of a temperature. Then it states, in analogy with the annealing of metals, that the temperature is made high in the early stages of the process for faster minimisation or learning, then is reduced for greater stability." Webster dictionary defines annealing as softening and toughening".

All independent claims of the present invention have the step (a) limitation "using simulation for determining an optimum join sequence". In the Specification and dependent claims the term "simulation" is specifically defined as used for obtaining a simulated composite table. The present invention thus creates a set of miniplans for simulating all possible joins. Thus, the present invention describes a two-pass process and simulates all possible joins, creates miniplans, obtains simulated composite table and creates an access path plan. None of these elements are taught or suggested in Iyer reference, which mentions as a prior art Simulated

Annealing method, because this method teaches away from the present invention because it uses a probability threshold or parameter which is progressively decreased, contrary to the claimed present invention.

Disregarding the law, instead of defining elements of the claims according to the Specification of the present invention, on p. 10 the Final Office Action states that the term "simulated" is not "specific to distinct over the applied prior art" and gives a vague Microsoft Dictionary p.437 definition of simulation instead, which is impermissible. Cited Microsoft Dictionary only gives a broad definition that simulation is an imitation. However, Examiner misinterprets this definition by giving it "the broadest claim interpreted, 'creating a set of miniplans' as Sigma is defined as the sum of the number of tupples, wherein miniplans are 'for simulating all possible joins' as a Sigma is used to pick from each join as it is performed in a join order among possible join orders (col. 3, lines 44-47)."

This terribly incoherent sentence probably alleges that sigma of Krishna reference and a miniplan of the present invention are, somehow, equivalents which is absurd. This allegation clearly confirms the Applicant's argument regarding the invalidity of 103 rejection of independent and dependent claims of the present invention.

Krishna reference defines cardinality of a table as the number of records, in col. 1, li. 14, and Sigma as a number of tupples estimated to result in each join, in col. 3, li. 46. Next, the reference calculates a sigma metric as a cardinality of each join by summing table cardinality estimates, preferably determined by a graph or retrieving a pre-computed value, as can be seen in col. 3, li. 46, li. 59-67. It merits the candidate join orders as a whole (Abstract) and not for partial miniplans. Cited col. 3-4 sections and Fig. 2 explicitly show obtainment of cardinality and calculation of sigma.

Present invention defines a miniplan in pages 6-7 of Specification as a control structure for adding a table to a composite table, for each step of a generated access path plan. It contains information such as: which table index to use, which join method to use, etc., and thus has nothing to do with number of tupples, cardinality and graphs. Therefore, sigma of Krishna has nothing to do with miniplans, simulation, two-pass method, access path plan and composite

tables of the present invention and is thus irrelevant. Thus, sigma and miniplan are not equivalents and simulation of the present invention is not an equivalent of simulated annealing.

Iyer reference in cited col. 6, li. 60-67 teaches use of the separation of the choice of the join method and join order which is irrelevant to the claimed present invention. Cited col. 7, li. 52-58 describes the cost of a join plan, which is also irrelevant to the claimed present invention. Therefore, Iyer reference does not teach, show or suggest any of the elements of claim 1 of the present invention because it does not teach use of simulation for determining an optimum join sequence, as claimed in the present invention and thus cannot invalidate the present invention. Thus both Krishna and Iyer references fail to teach or suggest use of simulation, the first and second pass, miniplans, composite tables and storing data for the least expensive join in the first pass, to be used in the second pass of the present invention.

Because this section on p. 10 of Final Office Action clearly shows that the Examiner misinterpreted both the present invention and the references, the 103 rejection of the independent claims of the present invention is invalid. Therefore, the Office Action itself admits that the Krishna and Iyer references cannot be used to reject the independent claims of the present invention. Thus, independent claims 1, 7, and 13, and all claims dependent upon are valid.

Further, throughout all Office Actions the Examiner appears to argue that because two references disclose the conventional terms well known and used in every write-up about database management systems that the references teach many elements in common with the claimed present invention and thus teach related art and can be combined to produce the claimed invention. Moreover, in order to satisfy rejection of just one limitation of a claim, the Examiner combines a few words from one column section with a few word from another column section with a few words from a third column section with a few words from the forth column section of the prior art. This gross misinterpretation of the law would deem every database invention obvious and unpatentable, because it is not the database term that can be taught by the prior art but the function, which is action taken upon this item.

Applicant respectfully objects to the practice used to reject claims of the present invention because in each rejection in Office Actions a few lines of reference were sited and never a whole

sentence or paragraph. Besides, the quoted language does not appear in the references and is taken verbatim from the claims of the present invention. Moreover, none of the references has even one whole element of the claims 1, 7 and 13 and their dependent claims. Moreover, each reference misses many elements of the claimed present invention, as shown in both Office Actions, and is from a different field.

Regarding Section Response to Arguments of the Final Office Action, Applicant points out that numerous pages of arguments were included in both Amendments and that, therefore, Applicant was not supplying only general allegations but very specifically pointed out numerous distinctions between the claimed invention and references and the law that was erroneously applied or not followed in the Office Actions. However, these arguments were completely disregarded and deemed moot in the Final Office Action.

Further, Examiner relied on common knowledge and Microsoft dictionary. MPEP 2144.3 section allows reliance on common knowledge in making a rejection only in limited circumstances, in light of recent court decisions, and very rarely in final rejection. It should always be supported by documentary evidence, except when the asserted facts are well-known and notorious or capable of instant and unquestionable demonstration as to defy dispute and serve only to fill in the gaps in an insubstantial manner, and is inappropriate otherwise, such as in the Final Office Action. It is never appropriate to rely solely on common knowledge in the art without evidentiary support in the record, as the principal evidence for rejection, and such action lacks substantial evidence in support of the rejection. Examiner failed to supply explicit documentary evidence and issued the Final Office Action, although MPEP 2144.3 requires that proof must be set forth explicitly and the Applicant must be allowed to challenge the assertion in the next reply after the Office Action. Moreover, Final Office Action introduced several new issues and alleged motivations, which Applicant has the right to rebut.

Therefore, Office Actions have not provided the evidence which is needed to support rejection, both the present invention and prior art were misinterpreted and the reasoning sweeps too wide and is without basis in law. Conclusionary statements of similarity without any articulated rationale or support do not constitute sufficient factual findings when not proven as similarity of structure, properties and utilities. Prior art relied upon does not render the present invention

unpatentable because it fails to teach or suggest any element of the independent claims of the present invention and thus does not satisfy all limitations of the claimed present invention and is not pertinent to the present invention. Because Office Actions have not met the burden of proof for obviousness, since they did not establish prima facie case requested by 35 U.S.C. section 103(a), the application is patentable and entitled to grant of the patent.

ii) Prima Facie Case of Obviousness by Prior Art Has Not Been Established and the Combination of Krishna Reference and Iyer Reference Would Not Satisfy All the Limitations of the Claims

To establish prima facie obviousness of a claimed invention, all the claims limitations must be taught or suggested by the prior art, MPEP Sec. 2143.03, citing *In re Royka*, 180 USPQ 580 (CCPA 1974).

As stated in MPEP Sec. 706.02(j), 35 U.S.C. 103 authorizes a rejection where, to meet the claim, it is necessary to modify a single reference or to combine it with one or more other references. After indicating that the rejection is under 35 U.S.C. 103, the examiner should set forth in the Office action:

(A) the relevant teachings of the prior art relied upon, preferably with reference to the relevant column or page number(s) and line number(s) where appropriate,
(B) the difference or differences in the claim over the applied reference(s),
(C) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and
(D) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP Sec. 2143 - 2143.03 for decisions pertinent to each of these criteria.

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). See MPEP Sec. 2144 - 2144.09 for examples of reasoning supporting obviousness rejections.

Office Actions did not follow this law. As shown by the Applicant, the teachings of the referenced prior art are not relevant to the claimed invention. As shown in Amendments, the

proposed modifications of the applied reference(s) necessary to arrive at the claimed subject matter are not shown, and an explanation about why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification was not given. Although Applicant argued that a combination or modification must be shown in the prior art itself, each Examiner's Office Action failed to address these points and follow the law. Regarding claims 1, 7 and 13, none of the cited references teaches, shows or suggests claimed subject of the present invention. Therefore, these reference cannot be used to invalidate independent claims 1, 7, and 13 and their dependent claims. Moreover, the Examiner quoted parts of sentences nonexistent in those references. However, even if these quotes are correct, the combination must be pointed to in the prior art itself and no such combination is pointed to in the cited references nor it could be since they perform differently. Therefore, these references cannot be used to invalidate independent claims 1, 7 and 13 and their dependent claims because they fail to teach or suggest any and all the steps of these claims.

Regarding independent claims 1, 7 and 13, the Final Office Action makes an unsupported conclusion that it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine Krishna and Iyer's teaching to improve speed. This section of Final Office Action is apparently used to show that modification and combination of these two references is allowable to support claims rejection under 35 USC Sec. 103(a).

However, "would have been obvious" allegations used to reject claims of the present invention are not sufficient under Sec. 103 and Examiner failed to cite prior art references which support the "would have been obvious" allegations, show how modifications can be accomplished, what motivation was used to modify a reference to arrive at the claimed subject matter, how this combination of modified references functions and which structure it has. Motivation shown in Final Office Action does not support the rejection. Moreover, it is required by law that the motivation to combine the references must be found in the referenced prior art before the references can be combined but supporting showing was not provided.

Methods taught by these two references are different of the present invention and are from different art fields, as shown above. References do not have the same or similar operation or structures. References cannot handle and do not perform all elements of the independent claims

1, 7 and 13 and, therefore, their dependent claims. Further, they satisfy a different need from a different area. Moreover, it is impossible to modify them to obtain the claimed present invention. Further, each cited reference is individually complete and they do not suggest a combination or modification and are impossible to combine.

Thus, Office Action has not established a prima facie case of obviousness because the three basic criteria stated above, which must be met, were not met because it did not point out: to any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine reference teachings to arrive at the claimed subject matter, a reasonable expectation of success was not shown (and is impossible) and that the prior art references, which must teach or suggest all the claim limitations, do so here, which they do not. Furthermore, the Office Actions did not satisfy the initial burden to provide some suggestion in the references of the desirability of doing what the inventor has done, because to support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

Further, each cited reference is individually complete and they do not suggest a combination or modification and are impossible to combine. Case *Amgen, Inc. v. Chugai Pharmaceutical Co.*, 927 F.2d 1200, 18 USPQ2d 1016 Fed. Cir. 1991) is on point as is the case *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), which held that where there is no technological motivation for a modification or if a proposed modification of reference would destroys intent, purpose or function of the reference, the prima facie case of obviousness is not properly established. This law was not followed in the Office Actions either.

In the present case, there is no reasonable expectation of success of combination in view of the teachings of references and the claimed limitations were not taught or suggested by the proposed combination. Examiner relied on unrelated general knowledge, but in such case it must be articulated and placed on the record. The deficiencies in the cited references cannot be remedied by Examiner's general conclusion about what is general knowledge or common sense. Examiner cannot rely on his own general knowledge but must find the motivation in the prior art references

themselves. To establish obviousness, the Examiner must do more than identify some elements of the claimed present invention in the prior art. It is not obvious to incorporate the elements of references to provide the claimed invention when Examiner's determination of motivation is only that it would not require excessive processing time, whereas the present invention clearly teaches a more important benefit of savings in storage locations and I/O resources, as well. This benefit was not shown anywhere in the Office Actions. Thus, the claimed invention could not be found obvious in view of references' teachings.

Therefore, it is clear that the standard for establishing the prima facie case of obviousness under 103(a) has not been met for the claimed invention because each cited reference does not have any and all elements of independent claims, is from a completely different field, has different components, works in a different mode of use and produces different results. Improper combination of cited references is used in each claim rejection in the Office Action. None of the cited references suggests combination under In re Sernaker, 217 U.S.P.Q. 1, 6 (CAFC 1983), and one skilled in the art would have no reason to make a combination since they are from different fields, impossible to combine and individually complete. Moreover, none of the cited references discloses the subject matter and features of claims 1, 7 and 13 of the present invention and even if they did show some individual features, they would not be able to meet the claims of the present invention which provide new and unexpected results over these references and are thus unobvious and patentable under Sec. 103. Therefore, there is no teaching given in Office Actions that shows that these references should be combined. Therefore, independent claims 1, 7 and 13 are not obvious and are patentable.

Because none of the referenced prior art teaches elements of claims 1, 7 and 13 and their combination is invalid, there is no valid reason for rejection of these independent claims and claims dependent thereof. Therefore, each cited reference, by itself or in combination, cannot be used to invalidate claims 1, 7 and 13 because they fail to teach any and all the steps of these claims. Thus, these references cannot be used to invalidate independent claims 1, 7 and 13 and their dependent claims and a prima facie case of obviousness has not been established under 35 USC Sec. 103(a).

iii) **The Examiner Uses Impermissible Hindsight to Modify the Teachings of Krishna Reference Based on Iyer in Order to Combine Them**

Examiner's assertion that it would clearly be obvious to combine selected references is based on nothing except the Examiner's bare opinion, hindsight, and a need to reconstruct the claimed invention. The teachings or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure (MPEP 2143). MPEP 2143.01 states that the proposed modification cannot render the prior art unsatisfactory for its intended purpose and cannot change the principle of operation of a reference. Examiner's suggestion to combine selected references would require a substantial reconstruction and redesign of the references, and is probably impossible to accomplish such a combination, as Applicant remarked in the Amendments, and would definitely change all references' basic principle under which they were designated to operate.

The mere fact that references can be combined or modified does not render the resulting combination obvious unless the prior art also suggests the desirability of the combination. See MPEP Sec. 2143.01, citing In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). It is impermissible to use "hindsight reconstruction to pick and chose among isolated disclosures in the prior art to deprecate the claimed invention." In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

As shown above, it is respectfully submitted that the prior art does not teach or even suggest modifying the teachings of Krishna and Iyer to combine them. It is only the impermissible hindsight by the Examiner that the teachings can be combined and the Examiner has impermissibly used conventional terms for picking and choosing isolated disclosures in the prior art to assert that the claims are unpatentable. The cited prior art only discloses conventional database terms which would not lead a person of ordinary skill to use those unrelated terms and functions to provide the claimed present invention. Moreover, it is impossible to combine the cited reference. Furthermore, these references teach against the present invention.

Therefore, none of the cited references, either alone or in combination taken as a whole, teaches or suggests all the limitations of independent claims 1, 7 and 13 and their dependent claims and none of the references even recognizes a need for such an invention because they are from different fields and the references cannot be combined. Since none of the references teach or

suggest the claimed subject matter of the present invention these cited references cannot be used to invalidate independent claims 1, 7 and 13 and their dependent claims because they fail to teach any and all the steps of these claims and they cannot be modified and combined. Thus, it is respectfully submitted that the cited prior art does not render claims 1, 7 and 13 and their dependent claims unpatentable.

Sec. 103(a) Rejection of Claims 2, 8 and 14

As for claims 2, 8 and 14, Office Action stated that Krishna teaches 'wherein the first pass performing successive steps until creation of a simulated composite table having all tables from the query' *as a joining of a plurality of tables R, S, and T from the query* [See col. 3, lines 31-32]. *There are two possible join orders for the tables R, S, and T. The first (1) possible join order is join tables R and S, then join the result with table T, the second (2) possible join order is join tables S and T, then join the result with table R* [See col. 3, lines 33-35], 'wherein each said step:

creating a set of miniplans for simulating all possible joins of a predetermined subset of the query tables' *as after joining the two possible join orders, the calculation of the total query for the join order (1) is 80(20+60) and the join order (2) is 560(500+60) are created* [See col. 3, lines 35-41]; and

'using a cost model calculations for estimating and saving the least expensive join from said set of joins, thereby determining the optimum join sequence' *as the cost estimate calculations for the join order (1) is 80 and the join order (2) is 560. Thus, the join order (1) is indicated the least expensive join order from the set of join orders* [see col. 3, lines 52-55].

The Applicant respectfully objected to this misinterpretation because Krishna reference does not have the quoted language. It is the language taken verbatim from the claim 2 of the present invention, with Krishna reference page numbers added. Thus, Krishna does not teach the quoted language. Cited Italic quotes are not taken verbatim from Krishna reference either but are related to it. These two parts are completely unrelated because Krishna reference does not even mention first pass, performing successive steps, creation of a simulated composite table, creation of miniplans for simulating all possible joins, etc., as shown above. Cited Italic quotes merely mention how many tupples are created when a join is performed in different ways in Krishna reference and do not teach process of join ordering. They neither show teachings of the present

invention nor the reference, just give a justification for join ordering. This is clearly seen in Col. 3, li. 30-43 which start with "Consider" and end with "the choice of join order can be significant".

Office Action fails to quote, however, the teachings of Krishna shown in col. 3, li. 44-67, as argued by the Applicant above, which clearly show that Krishna reference does not teach use of a two pass process for creating a lowest cost access path plan, does not use simulation, and does not create miniplans and composite tables. It is true that Krishna reference uses a lowest cost, but Krishna reference calculates sigma metric as a cardinality of each join by summing table cardinality estimates, preferably determined by a graph or retrieving a pre-computed value, as can be seen in col. 3, li. 46, li. 59-67.

Moreover, it is shown above that this reference does not perform any elements of the independent claims 1, 7 and 13, and therefore their dependent claims. It is from a different field, does not need or suggest modification and combination with another reference and such combination is impossible. Further, it satisfies a different need from a different area. Therefore, the reference is not pertinent and cannot be used to reject these claims. Thus, dependent claims 2, 8, and 14 and all claims dependent upon them in the present invention recite novel and nonobvious structure and therefore distinguish over the cited prior art, Krishna, and are not obvious under 35 U.S.C. 103(a).

Thus, Final Office Action has not established a prima facie case of obviousness because the three basic criteria stated above, which must be met, were not met because it did not point out: to any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine reference teachings to arrive at the claimed subject matter, a reasonable expectation of success was not shown (and is impossible) and that the prior art references, which must teach or suggest all the claim limitations, do so here, which they do not. Furthermore, the Office Action did not satisfy the initial burden to provide some suggestion in the references of the desirability of doing what the inventor has done, because to support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan

would have found the claimed invention to have been obvious in light of the teachings of the references.

Because none of the referenced prior art teaches elements of claims 2, 8 and 14 and their combination is invalid, there is no valid reason for rejection of these dependent claims. Therefore, each cited reference, by itself or in combination, cannot be used to invalidate claims 2, 8 and 14 because they fail to teach any and all the steps of these claims. Thus, these references cannot be used to invalidate these dependent claims and a prima facie case of obviousness has not been established under 35 USC Sec. 103(a).

Sec. 103(a) Rejection of Claims 5, 11, and 17

As for claims 5, 11 and 17, Office Action stated that Krishna teaches 'wherein the second pass performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step being performed in the optimum join sequence' *as if the join orders remain to be examined, the process repeats for the next possible join order. A join order with the smallest value is used to perform the join query* [See col. 4, lines 4-7].

The Applicant respectfully objected to this misinterpretation because Krishna reference does not have the quoted language. It is the language taken verbatim from the claim 5 of the present invention, with Krishna reference page numbers added. Thus, Krishna does not teach the quoted language. Cited Italic quotes are not taken verbatim from Krishna reference either but are related to it. These two parts are completely unrelated because Krishna reference does not even mention second pass, performing successive steps, creation of a simulated composite table, etc., as shown above.

Office Action failed to cite properly col. 4, lines 4-7 of Krishna, which clearly states verbatim: *A join order with the smallest value* Of Sigma *is used to perform the join query.* This clearly shows that Krishna reference does not teach use of a two pass process for creating a lowest cost access path plan, does not use simulation, and does not create miniplans and composite tables, but that Krishna reference calculates sigma metric as a cardinality of each join by summing table

cardinality estimates, preferably determined by a graph or retrieving a pre-computed value, as can be seen in col. 3, li. 46, li. 59-67.

Further, Office Action failed to cite fully the definition of a process which *repeats for the next possible join order. The process* is described in col. 3, li. 46, li. 59-67 of Krishna as: calculation of sigma metric as a cardinality of each join by summing table cardinality estimates, preferably determined by a graph or retrieving a pre-computed value, which is not the method of the present invention. Moreover, nowhere does Krishna reference even mention a second pass, or a first pass. Further, Krishna reference does not even mention a creation of miniplans and a simulated composite table, and it was stated in Office Action that it does not teach simulation.

Therefore, the reference cannot be used to reject these claims. Thus, dependent claims 5, 11, and 17 and all claims dependent upon them in the present invention recite novel and nonobvious structure and therefore distinguish over the cited prior art, Krishna, and are not obvious under 35 U.S.C. 103(a).

Moreover, it is shown above that this reference does not perform any elements of the independent claims 1, 7 and 13, and therefore their dependent claims. It is from a different field, does not need or suggest modification and combination with another reference and such combination is impossible. Further, it satisfies a different need from a different area. Therefore, the reference is not pertinent and cannot be used to reject these claims. Thus, dependent claims 5, 11, and 17 and all claims dependent upon them in the present invention recite novel and nonobvious structure and therefore distinguish over the cited prior art, Krishna, and are not obvious under 35 U.S.C. 103(a).

Thus, Final Office Action has not established a prima facie case of obviousness because the three basic criteria stated above, which must be met, were not met because it did not point out: to any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine reference teachings to arrive at the claimed subject matter, a reasonable expectation of success was not shown (and is impossible) and that the prior art references, which must teach or suggest all the claim limitations, do so here, which they do not. Furthermore, the Office Action did not satisfy the initial burden to provide some suggestion in the references of the desirability of doing what

the inventor has done, because to support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

Because none of the referenced prior art teaches elements of claims 5, 11 and 17 and their combination is invalid, there is no valid reason for rejection of these dependent claims. Therefore, each cited reference, by itself or in combination, cannot be used to invalidate claims 5, 11 and 17 because they fail to teach any and all the steps of these claims. Thus, these references cannot be used to invalidate these dependent claims and a prima facie case of obviousness has not been established under 35 USC Sec. 103(a).

Sec. 103(a) Rejection of Claim 6, 12 and 18

As per claim 6, 12 and 18 Office Action stated that Krishna teaches 'wherein the query being a SQL query as *an SQL query* [See col. 4, lines 38-40].

The Applicant respectfully objected to this misinterpretation because Krishna reference does not have the quoted language. It is the language taken verbatim from the claim 6 of the present invention, with Krishna reference page numbers added. Cited section, starting at col. 4, lines 38-40, only shows an exemplary SQL query to be considered as an example (col. 4, li. 42). Thus, Krishna does not teach the quoted language. Cited Italic quotes are not taken verbatim from Krishna reference either but are related to it.

Therefore, the reference cannot be used to reject these claims. Thus, dependent claims 6, 12, and 18 and all claims dependent upon them in the present invention recite novel and nonobvious structure and therefore distinguish over the cited prior art, Krishna, and are not obvious under 35 U.S.C. 103(a).

Moreover, it is shown above that this reference does not perform any elements of the independent claims 1, 7 and 13, and therefore their dependent claims. It is from a different field, does not need or suggest modification and combination with another reference and such

combination is impossible. Further, it satisfies a different need from a different area. Therefore, the reference is not pertinent and cannot be used to reject these claims. Thus, dependent claims 6, 12, and 18 and all claims dependent upon them in the present invention recite novel and nonobvious structure and therefore distinguish over the cited prior art, Krishna, and are not obvious under 35 U.S.C. 103(a).

Thus, Final Office Action has not established a prima facie case of obviousness because the three basic criteria stated above, which must be met, were not met because it did not point out: to any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine reference teachings to arrive at the claimed subject matter, a reasonable expectation of success was not shown (and is impossible) and that the prior art references, which must teach or suggest all the claim limitations, do so here, which they do not. Furthermore, the Office Action did not satisfy the initial burden to provide some suggestion in the references of the desirability of doing what the inventor has done, because to support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

Because none of the referenced prior art teaches elements of claims 6, 12 and 18 and their combination is invalid, there is no valid reason for rejection of these dependent claims. Therefore, each cited reference, by itself or in combination, cannot be used to invalidate claims 6, 12 and 18 because they fail to teach any and all the steps of these claims. Thus, these references cannot be used to invalidate these dependent claims and a prima facie case of obviousness has not been established under 35 USC Sec. 103(a).

8. Conclusion

Regarding claims 1-2, 5-8, 11-14 and 17-18, none of the cited references teaches, shows, suggests or is even remotely related to the claimed present invention. Therefore, these reference cannot be used to invalidate independent claims 1, 7, and 13 and their dependent claims.

APPENDIX

WHAT IS CLAIMED IS:

1. **(Previously Amended)** A computer-based method for determining the optimum join sequence for processing a query having a plurality of tables from a relational database stored in an electronic storage device having a database management system, the method comprising the steps of:

(a) a first pass using simulation for determining an optimum join sequence for joining the plurality of tables from the query; and

(b) a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query.

2. **(Original)** The method according to claim 1, wherein the first pass performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step:

creating a set of miniplans for simulating all possible joins of a predetermined subset of the query tables; and

using a cost model calculations for estimating and saving the least expensive join from said set of joins, thereby determining the optimum join sequence.

3. **(Original)** The method according to claim 2, wherein the first pass for each said miniplan storing a used table index, join method, and sorting data, and for each said least expensive join storing names of joined tables, join cost and possible row orderings.

4. **(Original)** The method according to claim 3, wherein the first pass only storing non-redundant miniplan data, and saving partial results of the cost model calculations for future reuse.

5. **(Original)** The method according to claim 1, wherein the second pass performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step being performed in the optimum join sequence.

6. **(Original)** The method according to claim 1, wherein the query being a SQL query.

7. **(Previously Amended)** A computer-based processor system for determining the optimum join sequence for processing a query having a plurality of tables from a relational database stored in an electronic storage device having a database management system, the system comprising:

means for performing a first pass using simulation for determining an optimum join sequence for joining the plurality of tables from the query; and

means for performing a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query.

8. **(Original)** The system according to claim 7, wherein the first pass means performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step:

creating a set of miniplans for simulating all possible joins of a predetermined subset of the query tables; and

using a cost model calculations for estimating and saving the least expensive join from said set of joins, thereby determining the optimum join sequence.

9. **(Original)** The system according to claim 8, wherein the first pass means for each said miniplan storing a used table index, join method, and sorting data, and for each said least expensive join storing names of joined tables, join cost and possible row orderings.

10. **(Original)** The system according to claim 9, wherein the first pass means only storing non-redundant miniplan data, and saving partial results of the cost model calculations for future reuse.

11. **(Original)** The system according to claim 7, wherein the second pass means performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step being performed in the optimum join sequence.

12. **(Original)** The system according to claim 7, wherein the query being a SQL query.

13. **(Previously Amended)** A computer usable medium tangibly embodying a program of instructions executable by the computer to perform a computer-based method for determining the optimum join sequence for processing a query having a plurality of tables from a relational database stored in an electronic storage device having a database management system, the method comprising the steps of:

(a) a first pass using simulation for determining an optimum join sequence for joining the plurality of tables from the query; and

(b) a second pass for using the optimum join sequence for creating a lowest cost access path plan for processing the query.

14. **(Original)** The method according to claim 13, wherein the first pass performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step:

creating a set of miniplans for simulating all possible joins of a predetermined subset of the query tables; and

using a cost model calculations for estimating and saving the least expensive join from said set of joins, thereby determining the optimum join sequence.

15. **(Original)** The method according to claim 14, wherein the first pass for each said miniplan storing a used table index, join method, and sorting data, and for each said least expensive join storing names of joined tables, join cost and possible row orderings.

16. **(Original)** The method according to claim 15, wherein the first pass only storing non-redundant miniplan data, and saving partial results of the cost model calculations for future reuse.

17. **(Original)** The method according to claim 13, wherein the second pass performing successive steps until creation of a simulated composite table having all tables from the query, wherein each said step being performed in the optimum join sequence.

18. **(Original)** The method according to claim 13, wherein the query being a SQL query.